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The *Entolomataceae* of the Pakaraima Mountains of Guyana 6: ten new species and a new combination in *Nolanea*

Terry W. Henkel*[1], M. Catherine Aime[2], David L. Largent[1], & Timothy J. Baroni[3]

[1]*Department of Biological Sciences, Humboldt State University, Arcata, California, USA. 95521*

[2]*Department of Botany & Plant Pathology, Purdue University, West Lafayette, Indiana, USA. 47907*

[3]*Department of Biological Sciences, State University of New York—College at Cortland, New York, USA. 13045*

*Correspondence to: *twh5@humboldt.edu*

Abstract — Eleven *Nolanea* species are described from Guyanese collections. The West African *N. acuta* comb. nov. is reported for the first time from the Neotropics, and *N. alboproxima*, *N. applanata*, *N. clavata*, *N. claviformis*, *N. concentrica*, *N. furcata*, *N. mimiae*, *N. rava*, *N. sinuolata*, and *N. subsulcata* are new to science. All of these species occur in tropical rainforests, either in Upper Potaro River Basin in Guyana's Pakaraima Mountains or in the interior lowlands, and are presumed forest litter saprotrophs. Macromorphological, micromorphological, and habitat data and comparisons with similar taxa are provided for each. The genus *Nolanea* has not been previously reported from Guyana.

Key words — *Agaricales, Agaricomycetes,* Guayana Highlands, Guiana Shield, saprotrophic fungi

Introduction

Species in the cosmopolitan genus *Nolanea* (Fr.) P. Kumm. are easily recognized as members of the *Entolomataceae* (*Agaricales*) due to their pink-pigmented basidiospores that are angular in all views. Fries (1821) erected *Agaricus* "tribus" *Nolanea* for pink-spored agarics with a mycenoid stature, and his concept, with refinements based primarily in micromorphological characters, has been accepted by many later agaricologists at either generic (e.g. Largent 1994; Largent & Baroni 1988; Dennis 1953, 1970; Pegler 1983, 1997) or subgeneric (Noordeloos 1980, 1992, 2004) rank.

Here we apply the generic concept of *Nolanea* sensu Largent (1994) diagnosed by mycenoid or collybioid (rarely tricholomatoid) basidioma stature;

typically glabrous (rarely innately appressed fibrillose) pileus; the pileipellis typically a cutis with 1–4 uninflated hyphal layers overlying the more inflated hyphae of the outer pileal trama; long-celled hyphal elements typically present in the pileal, lamellar, and stipe tramas; lipoid globules, brilliant granules, and pseudocystidia absent; clamp connections typically absent (occasionally rare or very scarce in the pileipellis); and a +5 urea concentration. Morphologically similar *Inocephalus* species can be most readily distinguished from *Nolanea* by a pileipellis that intergrades imperceptibly into the pileal trama, a 0 or 0.5 urea concentration, and (for most *Inocephalus* species) the combination of abundant lipoid bodies in the tramal hyphae, pseudocystidia in the hymenium, clamp connections in the pileipellis, and a distinctly fibrillose or squamulose pileus (Largent 1994).

The few molecular systematics studies published on *Entolomataceae* have proved rather equivocal regarding the status of *Nolanea* at the generic or subgeneric levels (e.g., Co-David et al. 2009; Baroni & Matheny 2011; He et al. 2013). Other preliminary molecular data support entolomatoid fungi with *Nolanea's* morphological diagnostic characters as a genus (Bergemann & Largent unpubl.). Given the current lack of clear, molecular-based resolution of genera within the *Entolomataceae*, we have used morphology to distinguish and describe the new taxa presented here.

New World tropical and subtropical entolomatoid species meeting the diagnostic requirements of *Nolanea* sensu Largent (1994) have been found in the Lesser and Greater Antilles (Murrill 1911; Pegler 1983), Trinidad and Venezuela (Dennis 1953, 1970), Brazil (Pegler 1997), and elsewhere in South America (Horak 1977).

We report here eleven *Nolanea* species for the first time from Guyana. One, *Nolanea acuta* comb. nov., was previously known from Gabon in West Africa; the other ten species are described as new to science: *N. alboproxima*, *N. applanata*, *N. clavata*, *N. claviformis, N. concentrica*, *N. furcata*, *N. mimiae*, *N. rava*, *N. sinuolata*, and *N. subsulcata*.

Materials & methods

Specimens were collected from the Upper Potaro River Basin during the May–August rainy seasons of 2000, 2003, 2005, 2007, 2009, 2010, and 2011 and the December rainy seasons of 2004 and 2009. The collecting area is located within a 15 km radius of a permanent base camp at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m, in an undulating valley approximately 15 km east of Mt. Ayanganna (2200 m) and is densely forested with a mosaic of primary *Dicymbe*-dominated and mixed forests of the *Eschweilera–Licania* association (Henkel 2003). Additional collections were made during the May–June 2011 rainy season from Guyana's Upper Demerara River Basin at Mabura Ecological Reserve within 2 km of a field station located at 5°09′19.0″N 58°41′58.9″W, elevation 100 m, in monodominant stands of *Dicymbe altsonii*.

Methods for field descriptions, microscopic analyses, and image capture follow Largent et al. (2008). The formula for Amman's solution is cited in Largent et al. (1977). Fungi were field-dried with silica gel. Color designations follow Kornerup & Wanscher (1978) with color plates noted in parentheses (e.g., 4A7). Specimens were deposited in the following herbaria: BRG, HSU, and PUL (Holmgren et al. 1990). Microscopic structures were measured as previously described (Largent 1994; Largent et al. 2008). Statistics determined include means of basidiospore length and width ± standard deviations; E = quotient of length by width indicated as a range variation in n objects measured; Q = the mean of E-values; n = number of objects measured.

Taxonomy

Nolanea acuta (Romagn. & Gilles) Largent, **comb. nov.** PLATE 1

MYCOBANK MB 519978

≡ *Rhodophyllus acutus* Romagn. & Gilles, Beih. zur Nova Hedwigia 59: 542 (1979)

PILEUS 21–32 mm broad, broadly convex with acute umbo; umbo and part of surrounding disc dark yellowish brown (5F8) because of appressed radial fibrils, background color lighter, maturing overall to light blond (4C3), non-hygrophanous; margin slightly inturned, somewhat rimose-frayed, not striate or translucent-striate. LAMELLAE subclose, subthick, very finely adnexed, becoming pinkish from spores (6B4); lamellulae 3 between lamellae, in 2 tiers. STIPE 70–85 × 3 mm wide at apex, 6 mm at base, tapered upward, whitish with appressed brown longitudinal fibrils. BASAL MYCELIUM scant, white, appressed felty. STIPE CONTEXT white, stuffed. ODOR and TASTE none.

BASIDIOSPORES distinctly 5–7-angled in profile, dorsal and ventral views, heterodiametric in all views, 7.8–11.3 × 5.2–7.5 µm (mean = 9.7 ± 0.83 × 6.7 ± 0.59 µm; E = 1.3–1.8, Q = 1.43 ± 0.09; n = 30); hilar appendage distinct. BASIDIA clavate, slightly to strongly tapered at the base, 27.7–33.1 × 7–10 µm (mean = 30.2 ± 1.8 × 8.6 ± 0.88 µm; E = 3.0–4.4, Q = 3.53 ± 0.30; n = 11), 4-sterigmate. CHEILOCYSTIDIA AND PLEUROCYSTIDIA absent. LAMELLAR TRAMA of long-celled, parallel to subparallel hyphae (not measured). PILEIPELLIS a cutis of uninflated hyphae that are 3.2–10.7 µm wide and rarely uplifted; TERMINAL CELLS cylindric to cylindro-clavate, 33.6–73.8 µm long. PILEUS TRAMA HYPHAE inflated beneath the pileipellis, 5–20 µm wide, elsewhere 5–40 µm wide. STIPITIPELLIS a cutis; hymenial clusters and caulocystidia absent. PIGMENTATION uniform, light to medium brown in the cytoplasm of the pileipellis; incrusted hyphae absent. REFRACTIVE HYPHAE abundant in the pileus trama. CLAMP CONNECTIONS absent. MICROCHEMICAL REACTIONS in Amman's solution: hymenial elements strongly cyanophilic.

ECOLOGY, RANGE, DISTRIBUTION — Scattered on soil in *Dicymbe corymbosa* forest in the Upper Potaro River Basin of Guyana; originally described from Gabon.

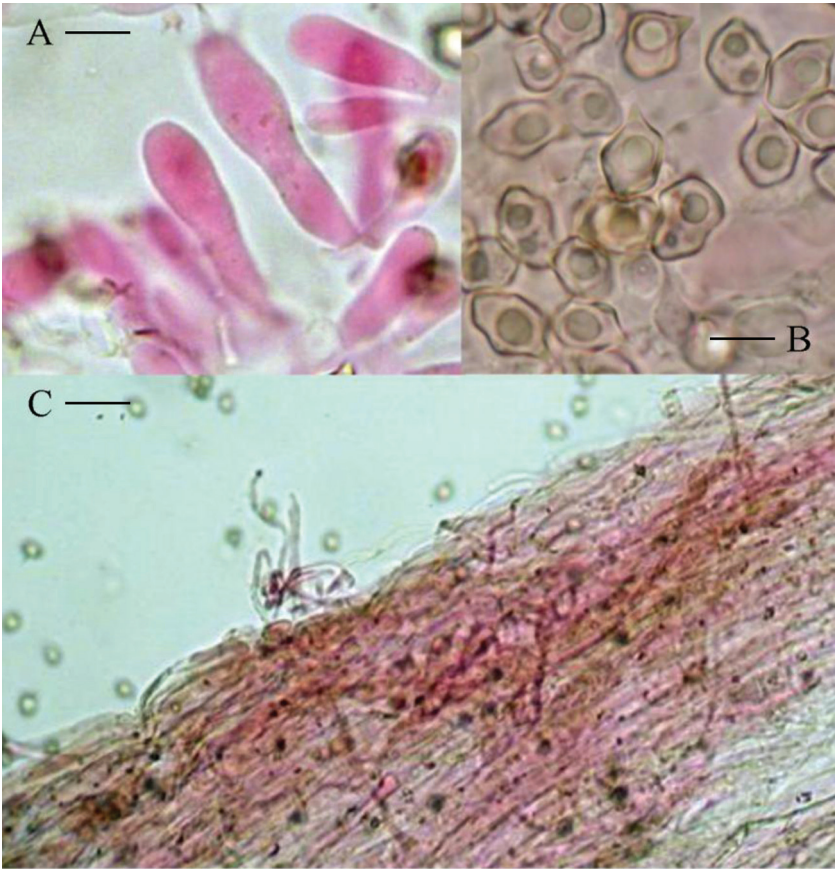

Plate 1. *Nolanea acuta* (Aime 1314). A. Basidia. B. Basidiospores. C. Pileipellis. Bars = 10 µm.

Specimen examined. **GUYANA. Region 8: Potaro-Siparuni**. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; vicinity of base camp, on soil, 21 June 2000, Aime 1314 (BRG; PUL).

Comments — *Nolanea acuta* is distinguished by its combination of relatively large basidiomata, a dark yellowish brown acutely umbonate pileus, clavate stipe with brownish longitudinal fibrils on a whitish ground, heterodiametric basidiospores averaging 9.7 × 6.7 µm (Q = 1.4), cytoplasmic pigmentation, and lack of hymenial cystidia. *Rhodophyllus acutus* from Gabon (Romagnesi & Gilles 1979) is morphologically identical to Guyanese *N. acuta*, justifying the new combination. The discovery of *N. acuta* in Guyana constitutes a significant intercontinental range extension for the species.

Nolanea acuta is similar to *N. solstitialis* (Fr.) P.D. Orton [≡ *Entoloma solstitiale* (Fr.) Noordel.] in pileus and stipe size, shape, and colors, basidiospore shape and size, and lack of cheilocystidia, but *N. solstitialis* can be distinguished by its translucent-striate hygrophanous pileus and smooth glabrous stipe (Noordeloos 1980, 1992, 2004).

Because of its basidioma colors, acutely umbonate pileus, and lack of cheilocystidia, *Nolanea acuta* resembles members of a species complex centered around *N. papillata* Bres., including *N. pseudopapillata* Pegler [= *N. papillata* sensu Dennis. non Bresadola], *N. mammifer* (Romagn.) Pegler [≡ *Rhodophyllus mammifer* Romagn.], and *N. apiculata* Petch [≡ *Entoloma acuminatum* E. Horak]. All these species differ from *N. acuta* primarily by their externally encrusting pileipellis pigments (Dennis 1970; Horak 1980; Pegler 1983).

Nolanea alboproxima Largent, Aime & T.W. Henkel, **sp. nov.** PLATE 2

MYCOBANK MB 519972

Differs from *Nolanea proxima* by its whitish overall coloration, heterodiametric basidiospores and lack of incrusting pigment in the pileus tramal hyphae.

TYPE: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~20 km east of Mt. Ayanganna, Tadang Base Camp 2 km south of Potaro River at 5°16′14.5″N 59°50′39.1″W, elevation 710–750 m; vicinity of base camp, 21 December 2009, Henkel 9116 (BRG, **holotype**; HSU, **isotype**).

ETYMOLOGY: *albus* (L. adj.) = white; referring to the whitish pileus color that differentiates *N. alboproxima* from *N. proxima*.

PILEUS 6–16.5 mm broad, 3–4.5 mm high, broadly convex to plano-convex to plane, somewhat flattened across apex and subumbilicate, glabrous, translucent striate from disc to margin, overall pale orangish white (4A2–4A3) to greyish orange (4B4–4B5) with age, moist; disc hygrophanous with medium grey cast; margin irregularly crenulate. LAMELLAE subclose, subthin, adnexed to barely adnate, 3–5 mm long, 0.5–2.0 mm tall, off-white at first (4A1–4A2), developing slight pinkish overtones (~5A3) with age; margins concolorous, nearly smooth under hand lens; lamellulae consistently 3 between lamellae, 0.5–2 mm long, in 2 tiers. STIPE 25–53 × 1–2 mm at apex, 2–4 mm at base, tapering upward, translucent, off-white (4A1–4A2) to pale light yellow (4A4), slightly yellowing (3A3–3A4) where handled, glabrous, hollow. BASAL MYCELIUM scant, white, and hispid at extreme base. ODOR none; TASTE not noted.

BASIDIOSPORES distinctly 5–6(–7)-angled and heterodiametric in profile view, 7.7–10.8 × 5.3–7.8 µm (mean = 9.3 ± 0.7 × 6.8 ± 0.57 µm; E = 1.2–1.7, Q = 1.38; n = 58). BASIDIA clavate and tapering to a long, slender base, 30.0–42.8 × 7.1–13.1 µm (mean = 35.0 ± 4.0 × 9.3 ± 1.5 µm; E = 2.3–5.2, Q = 3.9 ± 0.86; n = 24), 2–4-sterigmate, abundant on the lamella edge. CHEILOCYSTIDIA and PLEUROCYSTIDIA absent. LAMELLAR TRAMA subparallel, relatively narrow; composed of long-celled hyphae, these 39.5–186.1 × 11.1–16.8 µm, poorly

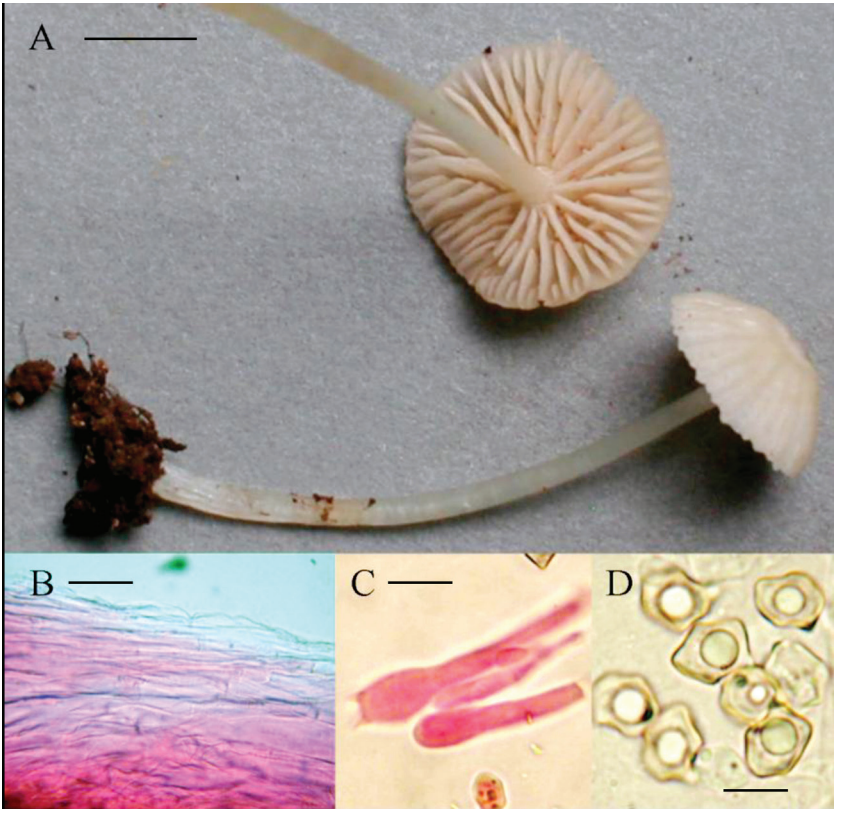

Plate 2. *Nolanea alboproxima* (holotype; Henkel 9116). A. Basidiomata. B. Pileipellis. C. Basidia. D. Basidiospores. Bars: A = 10 mm; B–D = 10 µm.

separating. Pileipellis a shallow cutis of 1–3 uninflated hyphal layers; hyphae 4–6 µm wide; terminal cells cylindric to cylindro-clavate, 45.9–180.9 × 4.2–6.7 µm. Pileal trama hyphae inflated beneath the pileipellis, 10–14 µm wide, elsewhere 96.8–273.4 × 8.6–24.8 µm. Stipitipellis a cutis; caulocystidia absent. Refractive hyphae abundant in the stipe trama, rare in the pileus trama, absent in the lamellar trama. Pigmentation minimal, apparently cytoplasmic, and not incrusting in the pileipellis. Clamp connections absent.

Ecology, range, distribution — Scattered on humus or seed husks in *Dicymbe* spp. forests; known only from the Upper Potaro River Basin of Guyana during the December–January rainy season.

Additional specimen examined. **GUYANA. Region 8: Potaro-Siparuni.** Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with

Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; on buried seed husk, 2 January 2004, Aime 2416 (BRG; PUL).

Comments — *Nolanea alboproxima* is distinguished by its small, plano-convex, pale yellowish white, translucent-striate pileus, pale yellow stipe, heterodiametric spores averaging 9.3 × 6.8 µm, and its lack of hymenial cystidia. Even though the basidioma colors are reminiscent of those predominant in *Alboleptonia*, *N. alboproxima* fits well in *Nolanea* because it combines a thin pileal cutis, inflated cells in the outermost pileal trama, and lack of clamp connections. Its overall aspect resembles an off-white form of *N. proxima* Largent or *N. cetrata* (Fr.) P. Kumm. Isodiametric basidiospores and externally encrusted pileus tramal hyphae distinguish *N. proxima* from *N. alboproxima*. *Nolanea cetrata* has similarly shaped and sized basidiospores but can be separated from *N. alboproxima* by its yellowish brown pileus, silvery striate stipe, bisterigmate basidia, and distinctive cytoplasmic or vacuolar pigment (Largent 1994).

Several other species representing other entolomatoid genera share similar basidioma color, basidiospore size, lack of odor, and lack of clamp connections with *Nolanea alboproxima*. Of these, *Entoloma purum* E. Horak & Desjardin from Hawaii is distinguished by its suede-like to pubescent pileus, trichodermial pileipellis, and much smaller basidiomata (pileus 4–10 mm broad, stipe 3–5 × 0.5–0.7 mm; Horak & Desjardin 1993). *Entoloma proprium* E. Horak from New Caledonia can be separated by its fimbriate lamellae, distinctive cheilocystidia, incrusting pigments, and abundant refractive hyphae (Horak 1980).

Rhodophyllus vetulus Romagn., *R. tortilis* Romagn., and *R. subsericellus* Pat. [≡ *R. platypus* Romagn, nom. illegit] from Madagascar and *R. flexuosipes* Romagn. & Gilles from Gabon resemble *N. alboproxima*. *Rhodophyllus vetulus*, although with a small pileus, resembles an *Entoloma* s. str. as it lacks inflated hyphae in the outer pileus trama and the stipe is >4 mm broad at the apex. *Rhodophyllus tortilis* is distinctive because of its leathery, somewhat scabrous pileus lacking striations, and overall lack of yellow tones in the basidiomata. *Rhodophyllus subsericellus* has a finely pilose, opaque pileus without striations (Romagnesi 1941, as *R. platypus*). *Rhodophyllus flexuosipes* is distinguished by its ≤70 mm long flexuous stipe and ≤35 mm broad campanulate pileus (Romagnesi & Gilles 1979).

Nolanea applanata Largent & T.W. Henkel, **sp. nov.** Plate 3

Mycobank MB 519974

Differs from *Entoloma bakeri* by its brownish orange, translucent-striate pileus and hollow stipe.

Type: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River

one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; 17 August 2007, Henkel 8872 (BRG, **holotype**; HSU, **isotype**).

Etymology: *applanatus* (L. adj.) = flat, referring to the pileus shape.

Pileus 45–55 mm broad, planate to upturned, with a low umbo, brownish orange (5C5) throughout, hygrophanous, becoming lighter first over disc and then outwards along radial striations, translucent-striate throughout except over the disc; surface appearing glabrous and moist throughout, under hand lens with extremely fine appressed radial fibrils; margin crenulate, irregularly splitting 1 or 2 times. Lamellae subdistant, subthick, abruptly adnexed, 20.5–24 mm long, 4–4.8 mm tall, pinkish tan (4A4–5A4); margins concolorous, finely and irregularly eroded under hand lens; lamellulae 1–2 between lamellae, 1–4 mm long. Stipe 62–97 × 4–7 mm (centrally), equal over apical ½, enlarging evenly over lower ½ to 9–11 mm wide at base, concolorous with pileus, glabrous to finely appressed fibrillose under hand lens over upper half, cartilaginous and twisting, with a hollow core. Basal mycelium scant, white, of matted hyphae. Odor none; taste minimal, slightly mealy.

Basidiospores distinctly 6–7(–8)-angled with the apex rounded and consistently heterodiametric in profile and dorsiventral views, 9.9–12.6 × 6.2–8.2 µm, (mean = 10.9 ± 0.6 µm × 7.1 ± 0.5 µm; E = 1.4–1.8, Q = 1.5 ± 0.1; n = 26). Basidia clavate, 36.3–47.3 × 6.5–12.2 µm, (mean = 43.8 ± 2.9 µm × 9.7 ± 1.3 µm, E = 3.5–4.9(–6.4), Q = 4.58 ± 0.7; n = 13), 2- or 4-sterigmate. Lamellar trama nearly parallel; hyphal cells very long, 149.4–542.8 × 9.0–18.4 µm; subhymenium narrow. Cheilocystidia and pleurocystidia absent. Pileipellis a cutis, 1–4 hyphal layers thick; hyphae 2–8 µm wide. Pileal trama hyphae inflated beneath the pileipellis, 8–18 µm wide, elsewhere very long-celled, 205–807 × 16.7–34.8 µm. Stipitipellis a cutis; hymenial clusters and caulocystidia absent. Refractive hyphae abundant immediately beneath the pileipellis, present but indistinct in the subhymenium, rare in the lamellar and stipe tramas. Pigmentation cytoplasmic, not incrusting in the pileipellis. Clamp connections absent.

Ecology, range, distribution — Occurring in a pair on root mat in *Dicymbe corymbosa* forest on sandy soils; known only from the type locality in the Upper Potaro River Basin of Guyana.

Comments — *Nolanea applanata* is distinguished by its dull flesh-tan to brownish orange, glabrous, hygrophanous, planate to upturned ≤55 mm broad pileus that is translucent-striate from disc to margin, concolorous stipe that is twisted, tapering upward, 60–97 × 4–7 mm (apex) to 9–11 mm (base), 6–8-angled basidiospores that average 10.9 × 7.1 µm, and absence of hymenial cystidia. Despite the rather large basidiomata, *N. applanata* fits well in *Nolanea* with its thin cuticular pileipellis, distinctly inflated outer pileal trama hyphae,

Plate 3. *Nolanea applanata* (holotype; Henkel 8872). A. Basidiomata. B. Pileipellis. C. Hymenium, basidia, and lamellar trama. D. Basidiospores. Bars: A = 10 mm; B–D = 10 µm.

very long-celled tramal hyphae in the pileus and stipe, as well as the translucent–striate pileus and twisted-striate, cartilaginous stipe.

While *Entoloma bakeri* Dennis from Martinique, Guadeloupe, and Trinidad is similar to *N. applanata* in basidioma size and stature, basidiospore dimensions, and absence of clamp connections, it can be distinguished by its cream–colored, silky-striate, innately fibrillose pileus and solid stipe (Pegler 1983).

Nolanea clavata Largent & T.W. Henkel, **sp. nov.** Plate 4
Mycobank MB 519975

Differs from *Entoloma conicoumbonatum* by its lack of incrusting pigments on the hyphae of the pileipellis and pileus trama and basidiospores with a higher length/width quotient.

Plate 4. *Nolanea clavata* (holotype; Henkel 8870). A. Basidiomata. B. Pileipellis. C. Basidia. D. Basidiospores. Bars: B = 10 mm; A, C, D = 10 µm.

Type: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; vicinity of base camp, 17 August 2007, Henkel 8870 (BRG, **holotype**; HSU, **isotype**).

Etymology: *clavatus* (L. adj.) = club-shaped, referring to the stipe shape.

Pileus 26–28 mm broad, 16–21 mm high, narrowly to broadly conic with rounded to subumbonate apex, dull greyish brown to dark brown (6E4–6F4)

throughout, slightly darker brown over disc (6F5), appressed radially fibrillose throughout, fibrils more compact over disc but hardly erect, somewhat shiny macroscopically, opaque, not hygrophanous, silky under hand lens, dry to submoist; margin broadly undulating forming coarse irregular ridges between wide radial furrows; extreme edge crenulate and lighter greyish brown (~6C3). Lamellae subclose, subthick, deeply adnexed, 11.5–12.0 mm long, 4–5 mm tall, dull dirty pink; margins concolorous and smooth; lamellulae 1–2 between lamellae, 1–3 mm long. Stipe 33–50 mm × 3–4 mm (centrally), equal over apical ½, enlarging evenly over lower ½ to 6–8 mm, forming a subbulbous, rounded base, light grey brown (6C2–6D2) throughout but lighter over basal bulb, appearing silky sericeous, smooth but with fine longitudinal striations under hand lens. Basal mycelium a fine white bloom at extreme base. Odor none; taste strongly farinaceous.

Basidiospores distinctly 5–6-angled, apex rounded and heterodiametric in profile and dorsiventral views, 8.7–11.9 × 5.7–8.2 (mean = 10.2 ± 0.7 × 6.9 ± 0.5 µm; E = 1.4–1.7, Q = 1.5 ± 0.1; n = 30). Basidia (2–)4-sterigmate, short clavate, tapering basally, 31.1–41.0 × 8.5–12.3 µm (mean = 34.9 ± 2.9 µm × 10.6 ± 1.1 µm; E = 2.9–3.9, Q = 3.3 ± 0.2; n = 14). Cheilocystidia and pleurocystidia absent. Lamellar tramal hyphae subparallel and broad; cells 72.2–166.6 × 11.2–19.9 µm, E = 4.7–11.2. Pileipellis a cutis, 1–4 hyphal layers thick; hyphae 1.5–6 µm wide; upturned hyphal ends rare to absent. Pileus tramal hyphae slightly interwoven, inflated beneath the pileipellis, 15–20 µm wide, elsewhere 53.6–132.7 × 15.4–32.4 µm (E = 1.9–5.0). Stipitipellis a cutis; hymenial clusters and caulocystidia absent. Stipe trama hyphae long and broad, 104.8–412.2 × 13.5–24.6 µm, (E = 4.3–30.5). Pigmentation not observed in water mounts, not obvious in 3% KOH, likely cytoplasmic and uniform in the suprapellis of the pileus; not obvious in the stipitipellis. Refractive hyphae in radial section abundant in the pileal trama near the subhymenium; rare to absent elsewhere. Clamp connections absent.

Ecology, range, distribution — Solitary on humic layer of forest floor under *Dicymbe corymbosa*; known only from the type locality in the Upper Potaro River Basin of Guyana.

Comments — *Nolanea clavata* is distinguished by its relatively large basidioma with conical, subumbonate, grey brown to dark brown, radially appressed-fibrillose pileus, clavate, light grey brown stipe, strongly farinaceous taste, absence of hymenial cystidia, and heterodiametric, 5–6-angled basidiospores averaging 10.2 × 6.9 µm. The radially appressed–fibrillose, tall, conic pileus and clavate stipe of *N. clavata* are reminiscent of species of the entolomatoid genus *Inocephalus*. However, *N. clavata* lacks lipoid globules and clamp connections, features typical of *Inocephalus* species, and has a thin pileipellis of repent hyphae overlying distinctly inflated tramal hyphae, features diagnostic for *Nolanea*.

Because of the similar pileus shape and color, basidiospore size, and lack of cheilocystidia, *N. clavata* resembles *Entoloma substrictior* (Singer) E. Horak from Argentina and Chile and *Entoloma cystopus* (Berk.) Sacc. from India and Malaysia. However, *E. substrictior* has much larger basidiomata with a ≤50 mm broad strongly striate pileus with a rugose surface (Horak 1977). *Entoloma cystopus* is also much larger, with a pileus up to 45 mm broad and stipe up to 140 mm long, and becomes pale livid yellow when dry (Horak 1980). *Entoloma conicoumbonatum* Hesler resembles *N. clavata* in basidioma size and colors and has similarly shaped basidiospores, but differs in having incrusting pigments on the hyphae of the pileipellis and pileus trama and basidiospores with an E = 1.1–1.3 and Q = 1.15 (Hesler 1967; Noordeloos 1988).

Nolanea claviformis Largent & Aime, **sp. nov.** PLATE 5

MYCOBANK MB 805593

Differs from all described species of *Nolanea* by its light brown, concentrically ridged pileus, orange-white lamellae, dark brown stipe, clavate cheilocystidia, and two types of pileus pigment.

TYPE: Guyana. Region 10: Upper Demerara-Berbice. Mabura Ecological Reserve: ~100 m northwest of Mabura field station at 5°09′19.0″N 58°41′58.9″W, elevation 100 m; in *Dicymbe altsonii* monodominant stand #1, 23 May 2011, Aime 4279 (BRG, **holotype**; PUL, **isotype**).

ETYMOLOGY: *claviformis* (L. adj.) = club-shaped, referring to the clavate cheilocystidia.

PILEUS 7–25 mm diam, 7–17 mm high, campanulate-conical, concentrically ridged with a broad umbo, satiny light brown (5D4), felty, with appressed longitudinal silky fibrils under hand lens; margin suggestively striate, crimped, and felty. LAMELLAE 2 mm tall, narrow, adnate, close to crowded, orange white (5A2); margins broadly scalloped under hand lens; lamellulae numerous, difficult to count. STIPE 25–69 × 1.5–2.5 mm, equal, concolorous with pileus, silky; pruina scant at apex under hand lens. BASAL MYCELIUM appressed, white, extending upward. CONTEXT thin, hollow in stipe. BRUISING REACTIONS none. ODOR none; TASTE none, mealy in texture.

BASIDIOSPORES distinctly 4–5(–6)-angled in all views, isodiametric in polar view, isodiametric to heterodiametric in profile view, 7.3–10.9 × 6.8–8.6 µm (mean = 9.0 ± 0.8 × 7.5 ± 0.48 µm, E = 1.0–1.4, Q = 1.20 ± 0.10; n = 31). BASIDIA clavate to cylindro-clavate, 28.2–42.5 × 9.5–13.0 µm (mean = 35.2 ± 4.8 × 10.7 ± 1.2 µm, E = 2.9–3.9, Q = 3.28 ± 0.4; n = 7), 4-sterigmate. CHEILOCYSTIDIA abundant, forming a sterile layer, clavate, colorless, 41.4–57.6 × 8.7–15.7 µm (E = 4.0–4.8; n = 6). PLEUROCYSTIDIA absent. LAMELLAR TRAMA HYPHAE subparallel, cells relatively short and broad, 50.8–130.0 × 9–14.0 µm (n = 4). PILEIPELLIS a cutis, 4–5 hyphal layers thick; hyphae 2.0–7.5 µm wide; TERMINAL CELLS cylindric to cylindro–clavate, narrow. PILEAL TRAMA HYPHAE slightly inflated beneath the pileipellis; cells 65.9–128.2 × 8.7–14.6 µm,

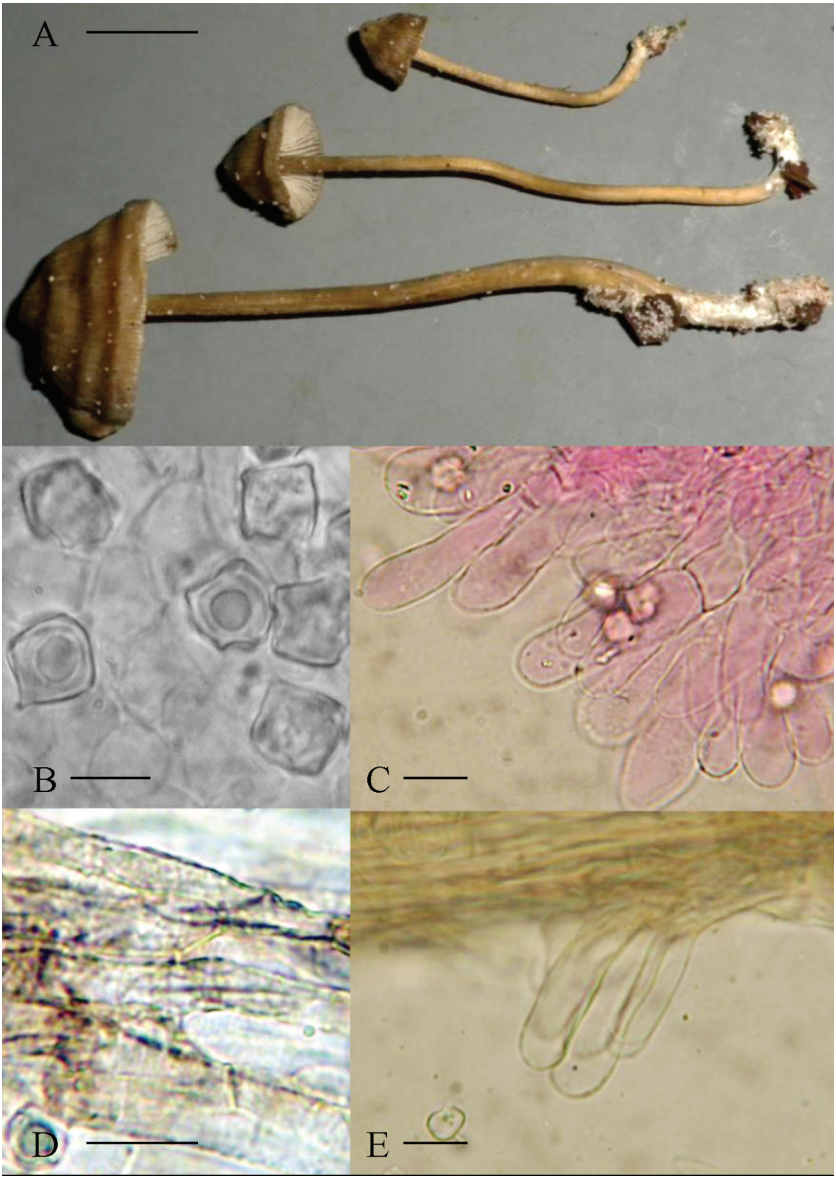

Plate 5. *Nolanea claviformis* (holotype, Aime 4279). A. Basidiomata. B. Basidiospores. C. Cheilocystidia. D. Pileipellis. E. Caulocystidia. Bars: A = 10 mm; B–D = 10 µm.

elsewhere up to 20 µm wide. Stipitipellis a cutis between scattered hymenial clusters at the apex; terminal cells in hymenial clusters clavate, colorless,

similar to basidia but more narrow, 30.9–43.4 × 4.7–12.2 µm (E = 3.6–6.6, Q = 5.0; n = 5). Stipe trama hyphae long; cells 72.3–768.4 × 13.9–30.1 µm (n = 4). Refractive hyphae absent. Pigmentation minutely to distinctly incrusting the walls of the more slender hyphae in the pileal trama, faintly cytoplasmic in the pileipellis hyphae. Clamp connections absent.

Ecology, range, distribution — Scattered on litter of forest floor in *Dicymbe altsonii* forests on sandy soils; known only from the type locality at Mabura Ecological Reserve, Guyana.

Comments — *Nolanea claviformis* is characterized by its concentrically ridged pileus, narrow crowded lamellae, and two types of pigment in the pileipellis.

Refer to the comments sections for *N. sinuolata* and *N. concentrica* for discussions of species similar to *N. claviformis*.

Nolanea concentrica Largent & T.W. Henkel, **sp. nov.** Plate 6

Mycobank MB 519976

Differs from *Nolanea bicoloripes* by its abundant cheilocystidia and much shorter stipe.

Type: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, 15–20 km east of Mt. Ayanganna, Tadang Base Camp 2 km south of Potaro River at 5°16′14.5″N 59°50′39.1″W, elevation 710–750 m; vicinity of base camp, 19 December 2009, Henkel 9106 (BRG, **holotype**; HSU, **isotype**).

Etymology: *concentricus* (L. adj.) = ringed, referring to the concentrically ridged, umbonate pileus umbo.

Pileus 18 mm broad, 7 mm tall, broadly conic with concentrically ridged umbo, apex submammilate but rounded, brown (6D5–6D6), slightly darker (6E6) over disc, shiny sericeous and moist throughout, finely translucent-striate over outer 2/3; margin finely roughened. Lamellae subthin, crowded, adnate, 8.3 mm long, 1.5–2.0 mm tall, pink; margins concolorous, roughened-cystidiate under hand lens. Stipe 42 mm × 1.5 mm, equal, tan brown (5C4–5C5) throughout, smooth with fine suberect fibrils under hand lens. Basal mycelium lacking. Odor mildly fungoid; taste not obtained.

Basidiospores distinctly 4–5-angled in all views, isodiametric in polar view, in profile and dorsiventral views isodiametric to heterodiametric, 6.5–9.0 × 5.1–6.9 µm (mean = 7.7 ± 0.64 × 6.0 ± 0.52 µm; E = 1.13–1.61, Q = 1.3 ± 0.13; n = 28). Basidia cylindro-clavate, 24.2–30.6 × 6.7–9.5 µm (mean = 27.4 ± 2.0 × 8.1 ± 0.8 µm; E = 3.4 ± 0.47, Q = 2.8–4.2; n = 13), tapering abruptly near base to 1.5–4.6 µm wide, 4-sterigmate; sterigmata 1.9–4.3 µm long. Cheilocystidia abundant, forming a sterile layer, hyaline, broadly aciculate to obclavate at first, ultimately long ventricose–rostrate, 34.4–121.9 × 5.8–16.1 µm (mean = 79.3 × 10.3 µm; E = 7.75, Q = 5.9–9.6; n = 10). Pleurocystidia absent. Lamellar trama hyphae subparallel, cells relatively short and broad, 69.8–121.7 × 10.1–13.7 µm. Pileipellis a cutis, 4–5 hyphal layers thick; hyphae 2.0–6.2 µm

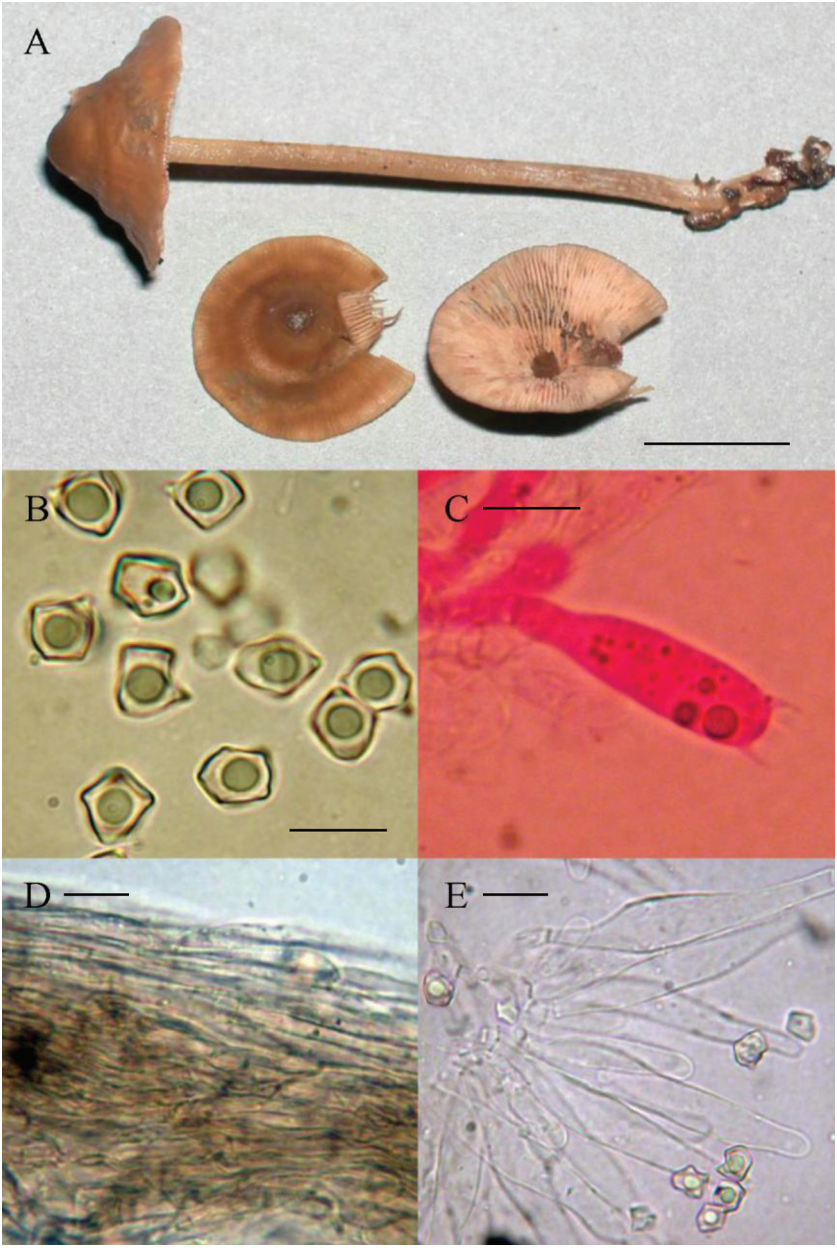

Plate 6. *Nolanea concentrica* (holotype; Henkel 9106). A. Basidioma and pilei. B. Basidiospores. C. Basidium. D. Pileipellis and pileal trama. E. Cheilocystidia. Bars: A = 10 mm; B–D = 10 µm.

wide; TERMINAL CELLS cylindric to cylindro-clavate. PILEAL TRAMA HYPHAE beneath the pileipellis slightly inflated, 8.7–14.6 µm wide; cells elsewhere 50.9–128.2 × 6.7–13.8 µm. STIPITIPELLIS not studied. REFRACTIVE HYPHAE absent. PIGMENTATION minutely incrusting the more slender hyphae in the pileal trama, faintly cytoplasmic within the pileipellis hyphae. CLAMP CONNECTIONS absent.

ECOLOGY, RANGE, DISTRIBUTION — Solitary on litter of forest floor in mixed *Dicymbe* spp. forest; known only from the type locality in the Upper Potaro River Basin of Guyana.

COMMENTS — *Nolanea concentrica* is distinguished by its dark brown, broadly conic pileus that is shiny sericeous, finely translucent-striate, and submammilate with a concentrically ridged umbo, crowded narrow lamellae, smooth equal stipe, abundant broadly aciculate to ventricose-rostrate cheilocystidia, and 4–5-angled basidiospores averaging 7.7 × 6.0 µm. *Nolanea bicoloripes* Largent & Thiers from western North America is similar to *N. concentrica* in the distinctive, concentrically ridged, umbonate, silky-sericeous pileus, narrow equal stipe, and some micromorphological features, but differs in its longer (≤140 mm) stipe and lack of cheilocystidia (Largent 1994).

Both *N. claviformis* and the sympatric *N. concentrica* have a concentrically ridged or beveled pileus, white lamellae, 4–5-angled basidiospores, and incrusting and cytoplasmic pigments in the pileipellis. *Nolanea claviformis* is distinguished by its clavate cheilocystidia, larger (~9.0 × 7.5 µm) basidiospores, and larger (28.3–42 5 × 9.5–12.0 µm) basidia. See the comments under *N. sinuolata* for additional information.

Nolanea subsolstitialis Largent from Washington, *N. infula* (Fr.) Gillet from the Netherlands and Sweden, and *N. solstitialis* from Europe also have small basidiospores, a beveled or concentrically ridged pileus, and a subpellis that is only slightly inflated and lack clamp connections. However, all three species lack cheilocystidia and have different stipe dimensions than *N. concentrica*. In addition, *N. solstitialis* has a distinct, abundant external incrusting pigment, *N. solstitialis* has intracellular pigment, and *N. infula* possesses both pigment types (Noordeloos 1980; Largent 1994).

Nolanea furcata Largent & T.W. Henkel, **sp. nov.** PLATE 7

MYCOBANK MB 805594

Differs from *Entoloma infula* var. *chlorinosum* by its non-papillate pileus, faint chlorine odor, and abundant cheilocystidia.

TYPE: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, 15–20 km east of Mt. Ayanganna, Tadang Base Camp 2 km south of Potaro River at 5°16′14.5″N 59°50′39.1″W, elevation 710–750 m; 0.5 km SW of Tadang Base Camp, 24 December 2009, Henkel 9139 (BRG, **holotype**; HSU, **isotype**).

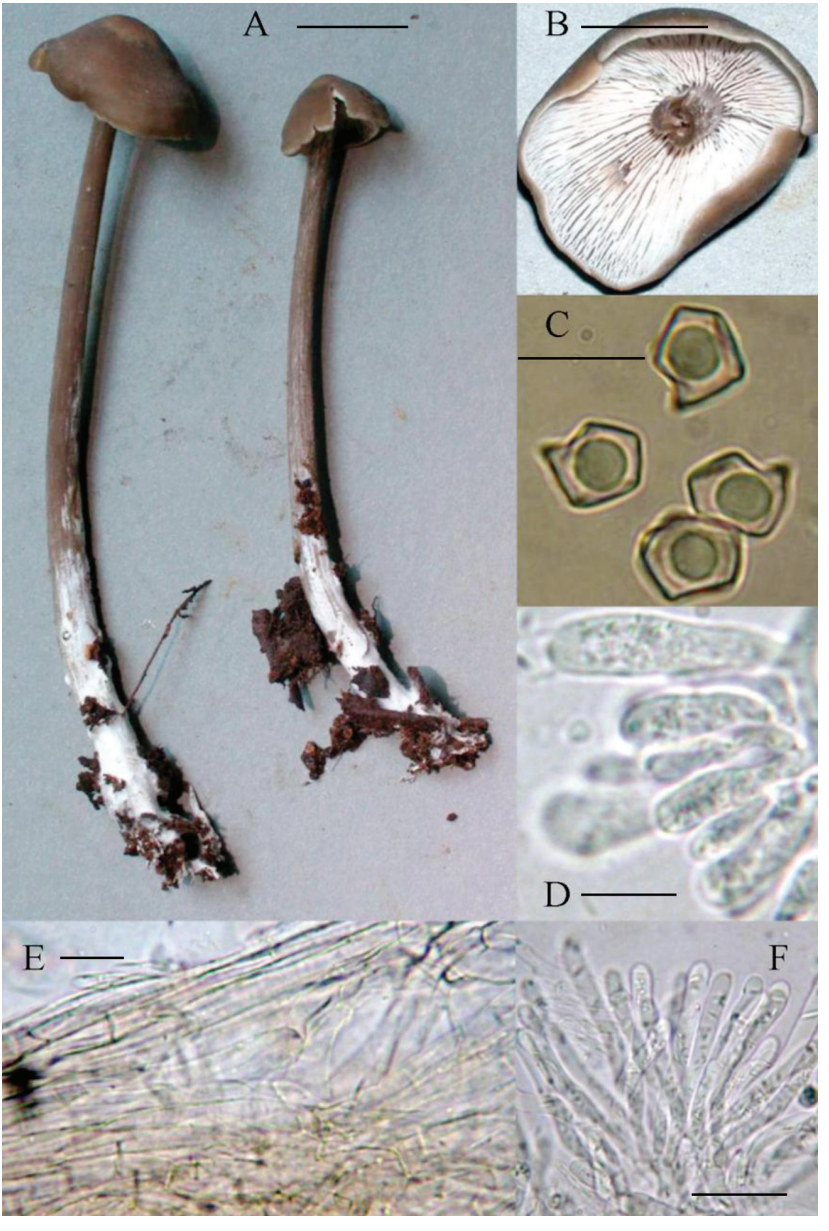

Plate 7. *Nolanea furcata* (holotype; Henkel 9139). A. Basidiomata. B. Hymenophore. C. Basidiospores. D. Basidia. E. Pileipellis and pileus tramal hyphae with external encrustations. F. Cheilocystidia. Bars: A, B = 10 mm; C–F = 10 µm.

Etymology: *furcatus* (L. adj.) = forked, referring to the irregularly forked lamellae.

Pileus broadly conic with subacute to rounded apex, 13–23 mm broad, 7–16 mm tall, greyish brown (6E3–E4), hygrophanous to lighter greyish brown (5D2–D3) over disc, appearing smooth macroscopically; surface under hand lens a dense, very fine fibrillose mat, this uniform throughout with no erect elements evident, not translucent-striate; margin slightly inrolled, otherwise entire and light grey; moist. Lamellae thin, crowded, adnate with a decurrent tooth, 6.5–15 long, 1–2 mm tall, forking irregularly, white to light pink (6A1–A2); margins concolorous, highly roughened-cystidiate under hand lens; lamellulae numerous, too crowded to count. Stipe subequal, tapering very slightly toward apex, 74–87 mm × 3–4 mm (centrally), base 4–6 mm, concolorous with the pileus over upper ¾, smooth, finely longitudinally fibrillose under hand lens. Basal mycelium over basal ¼ of stipe a dense, white fibrillose mat. Pileus context light grey. Stipe context grey, hollow. Bruising reactions none. Odor faintly of detergent or chlorine; taste pleasantly fungoid.

Basidiospores distinctly (4–)5-angled and subisodiametric to heterodiametric in profile view, 6.6–8.4 × 5.1–7.2 µm (mean = 7.5 ± 0.4 × 6.0 ± 0.5 µm; Q = (1.09–)1.14–1.46, E = 1.26 ± 0.1; n = 25). Basidia clavate, strongly tapered basally, 27.6–35.6 × 5.8–11.1 µm (mean = 30.8 ± 2.3 × 8.5 ± 1.6 µm; Q = 2.95–5.1, E = 3.8 ± 0.8; n = 12); base 2.7–5.2 µm wide; 4–sterigmate; sterigmata 1.4–3.2 µm long. Cheilocystidia abundant, forming a sterile layer on the gill edge, uniformly cylindro-clavate, colorless, 47.9–74.3 × 3.7–5.9 µm. Pleurocystidia absent. Lamellar trama hyphae subparallel, relatively slender and uniform in width; cells 54.8–112.2 × 3.7–6.1 µm. Pileipellis a cuticular layer of largely repent, entangled, relatively narrow hyphae; terminal cells cylindro-clavate, 20.1–49.3 × 4.1–9.3 µm (n = 11). Pileal trama hyphae beneath the pileipellis slightly to distinctly inflated; cells 38.0–134.4 × 6.2–13.8 µm (n = 8), not measured elsewhere. Stipitipellis with an entangled hyphal layer similar to the pileipellis, with hymenial clusters at the stipe apex; terminal cells abundant, somewhat opaque, similarly-shaped as, but longer than the cheilocystidia, 20–137.8 × 3.2–6.3 µm (n = 7). Refractive hyphae abundant in the pileal trama, absent in the lamellar trama and the subhymenium. Pigmentation of two types in the pileipellis: uniformly cytoplasmic and faintly brownish and with external encrustations; pileus trama hyphae strongly externally encrusted. Clamp connections absent.

Ecology, range, distribution — Scattered on litter of forest floor in mixed *Dicymbe* spp. forest; known only from the type locality in the Upper Potaro River Basin of Guyana.

Comments — *Nolanea furcata* is distinguished by its conic, dark brownish grey, hygrophanous, opaque pileus, narrow, crowded, irregularly forked lamellae that are white initially, faintly detergent-like or chlorine-like odor,

abundant cylindro-clavate cheilocystidia and caulocystidia, cytoplasmic and externally incrusted pigment in the pileipellis, and relatively small (~7.5 × 6.0 µm) 4–5-angled basidiospores. *Entoloma infula* var. *chlorinosum* (Arnolds & Noordel.) Noordel. from Europe shares a dark brown pileus and stipe, the two types of pileipellis pigments, somewhat similarly shaped basidiospores, and chorine-like odor but fundamentally differs from *N. furcata* in its papillate pileus, persistent and much stronger chlorine-like odor, and lack of cheilocystidia (Noordeloos 1992). For additional information on *Nolanea* species similar to *N. furcata*, refer to the comments for *N. sinuolata*.

Nolanea mimiae Largent & Aime, **sp. nov.** PLATE 8

MYCOBANK MB 805595

Differs from *Nolanea mammosa* var. *venezuelana* by its non-papillate pileus and presence of pleurocystidia.

TYPE: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; up Potaro River from base camp on line to Lance's plot near Blackwater Creek, 25 July 2010, Aime 4024 (BRG, **holotype**; PUL, **isotype**).

ETYMOLOGY: In honor of Mimi Chin, long-time Guyana field assistant and finder of the type collection.

PILEUS 19 mm broad, 11 mm tall, conical, lacking an umbo, glabrous macroscopically but faintly appressed-fibrillose under hand lens, opaque, not hygrophanous, not translucent striate, dark brown (6E7), slightly darker over the disc; margin crenulate and lighter. LAMELLAE subthin, close, adnate, 13 mm long, 3 mm tall, pale yellow (4A3) initially, later with pink spots; margins concolorous with face, roughened-cystidiate under hand lens. STIPE 60 mm × 1.5 mm, equal, dark yellowish brown (5F8), glabrous, inserted; trama hollow. BASAL MYCELIUM lacking. BRUISING REACTIONS none. ODOR indistinct; TASTE none at first, then somewhat soapy.

BASIDIOSPORES distinctly 5-angled, isodiametric to heterodiametric in profile view, 8.4–10.9 × 6.7–8.8 µm (mean = 9.8 ± 0.6 × 7.8 ± 0.5 µm; E = 1.1–1.5, Q = 1.26 ± 0.10; n = 34). BASIDIA cylindro-clavate, 27.6–32.0 × 10.5–13.5 µm (mean = 30.0 ± 1.5 × 11.7 ± 1.0 µm, E = 2.2–2.9, Q = 2.6 ± 0.3; n = 6), 4-sterigmate. CHEILOCYSTIDIA scattered to abundant, colorless, lageniform, 27.4–68.8 × 6.4–18.4 µm (E = 3.6–5.8; n = 9). PLEUROCYSTIDIA infrequent to scattered, similar in shape to cheilocystidia, 26.4–64.1 × 5.0–14.1 µm (E = 2.4–10.5; n = 14). LAMELLAR TRAMA HYPHAE subparallel; cells 187.4–480.6 × 8.6–29.5 µm (n = 4). PILEIPELLIS a cutis, 5–7 hyphal layers thick; hyphae 3.7–8.1 µm wide; TERMINAL CELLS cylindro–clavate, 26.9–37.1 × 2.5–7.6 µm (E = 4.4–10.8; n = 5). PILEAL TRAMA HYPHAE beneath the pileipellis slightly inflated, 5.7–14.3 µm wide; cells elsewhere inflated, relatively long and tapered

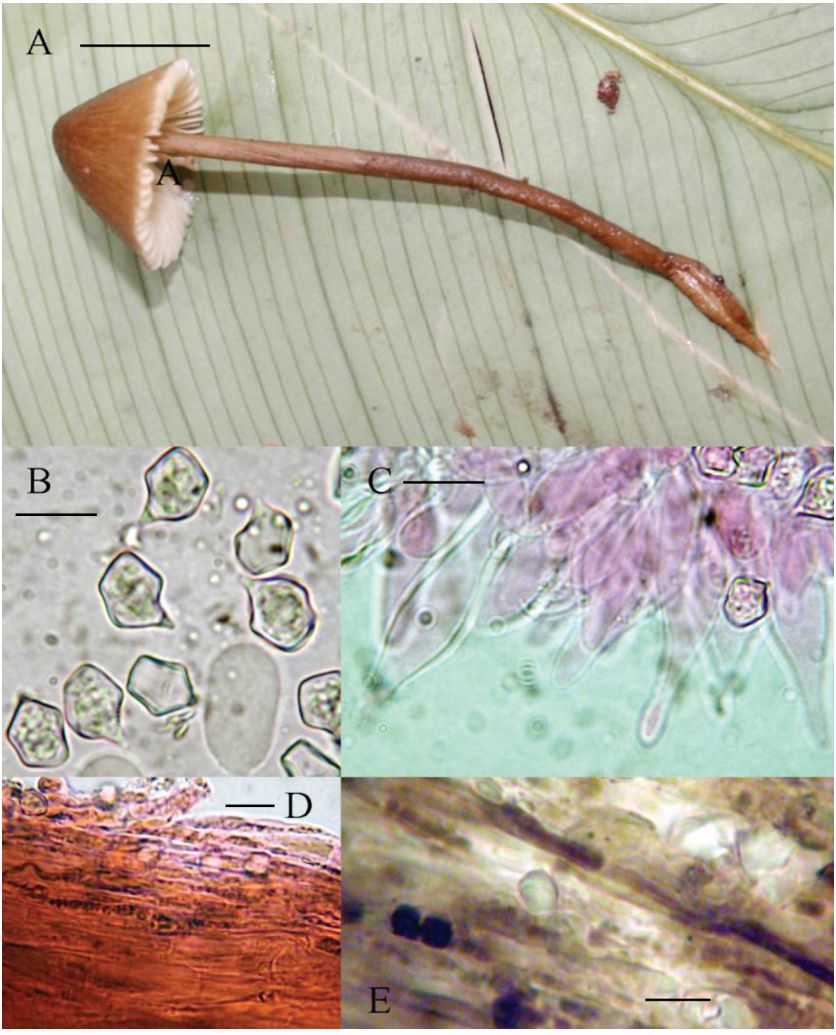

Plate 8. *Nolanea mimiae* (holotype; Aime 4024). A. Basidioma. B. Basidiospores. C. Cheilocystidia. D. Pileipellis. E. Cytoplasmic pigments in the pileipellis hyphae. Bars: A = 10 mm; B–E = 10 µm.

at both ends, 53.7–394.1 × 15.3–30.2 µm (n = 7). Stipitipellis at the apex with rare clusters of basidia, and rare terminal cells, these slightly out-turned, cylindro-clavate, 30.8–42.6 × 3.4–6.2 µm (n = 4), elsewhere a cutis. Stipe tramal hyphae 56.9–377.8 × 10.9–23.9 µm (n = 7). Refractive hyphae glistening in 3% KOH, abundant in the pileal trama, absent in the lamellar trama; not studied in the stipe trama. Pigmentation cytoplasmic in the hyphae

of the pileipellis, in the form of abundant dark brown, plaque-like agglutinated clots, absent in all other tissues. Clamp connections absent.

Ecology, range, distribution — Solitary on litter of forest floor in mixed *Dicymbe* spp. forest; known only from the type locality in the Upper Potaro River Basin of Guyana.

Comments — *Nolanea mimiae* is distinguished by its conical, non-umbonate, opaque, non-hygrophanous, dark brown pileus, pale yellow lamellae, dark yellowish brown stipe, scattered lageniform cheilocystidia and pleurocystidia, cytoplasmic pigment in the pileipellis, and nearly heterodiametric 5-angled basidiospores averaging 9.8 × 7.8 µm. These characters, along with the cytoplasmic pigment in the form of plaques or clots, and the mild then soapy taste, make *N. mimiae* unique among previously described *Nolanea* species.

Nolanea mammosa var. *venezuelana* Dennis from Venezuela [≡ *Rhodophyllus venezuelanus* (Dennis) Singer from Chile] and *Entoloma taedium* E. Horak from Chile are somewhat similar to *N. mimiae* because of their lageniform cheilocystidia and basidioma colors. *Nolanea mammosa* var. *venezuelana* differs from *N. mimiae* by its papillate pileus and lack of pleurocystidia (Singer 1969; Dennis 1970). *Entoloma taedium* differs by its distant pallid lamellae, lack of pleurocystidia, and cytoplasmic pigment in the cheilocystidia (Horak 1977).

Nolanea rava Largent & Aime, **sp. nov.** Plate 9

Mycobank MB 805596

Differs from *Entoloma acutopallidum* by its greyish yellow pileus, 5–6-angled basidiospores, obclavate to rostrate-ventricose cheilocystidia, and abundant pleurocystidia.

Type: Guyana. Region 10: Upper Demerara-Berbice. Mabura Ecological Reserve: ~100 m northwest of Mabura field station at 5°9′19.0″N 58°4′58.9″W, elevation 100 m; in *Dicymbe altsonii* monodominant stand #1, 27 May 2011, Aime 4312 (BRG, **holotype**; PUL, **isotype**).

Etymology: *ravus* (L. adj.) = greyish-yellow, referring to the color of the pileus and stipe.

Pileus 13 mm broad, 10 mm tall, conical with a tiny, nipple-like umbo that is 1 mm long, dry, silky, at first greyish yellow (4B4), remaining so on the disc and umbo, elsewhere becoming pale greyish yellow (4B3), hygrophanous, shallowly sulcate and translucent-striate to disc, glabrous; margin decurved, broadly undulating in outline. Lamellae thin, close, adnexed, 11.5 mm long, 3–5 mm tall, flesh-colored (6B3) with masses of concolorous basidiospores visible under hand lens; margins entire, concolorous and undulating; lamellulae 3–5 between lamellae. Stipe 37 × 2 mm at apex, 3 mm base, somewhat flattened and tapered from base to apex, glabrous but obscurely longitudinally striate under hand lens, greyish yellow (4B4) like the mature pileus disc. Basal mycelium absent.

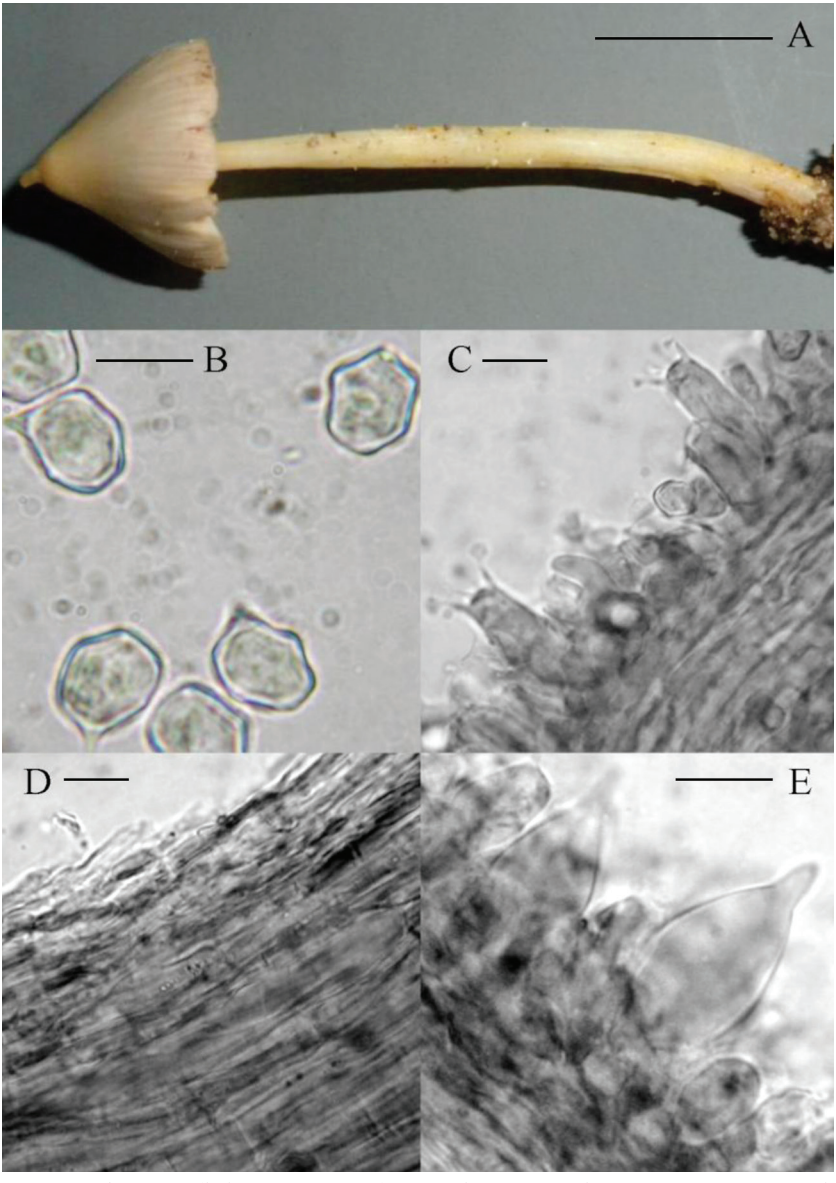

Plate 9. *Nolanea rava* (holotype; Aime 4312). A. Basidioma. B. Basidiospores. C. Hymenium with basidia. D. Pileipellis and pileal trama. E. Cheilocystidia. Bars: A = 10 mm; B–D = 10 µm.

Context not examined. Bruising reactions yellowish near the pileus margin. Odor none; taste not obtained.

Basidiospores distinctly 5–6-angled in all views, isodiametric to heterodiametric in profile and dorsiventral views, angles at times somewhat rounded, 9.4–11.9 × 7.6–9.8 µm (mean = 10.5 ± 0.6 × 8.5 ± 0.49 µm; E = 1.0–1.3, Q = 1.24 ± 0.08; n = 34). Basidia cylindro-clavate, hardly tapered, 29.8–43.0 × 10.5–13.5 µm (mean = 36.8 ± 3.7 × 11.6 ± 0.9 µm; E = 2.4–3.6, Q = 3.2 ± 0.4; n = 12); 4–sterigmate; sterigmata up to 5.0 µm long. Cheilocystidia abundant, colorless, obclavate to rostrate-ventricose, base rounded, 26.7–62.0 × 9.0–26.8 µm (mean = 42.7 ± 11.9 × 15.3 ± 6.1 µm; E = 1.9–4.9, Q = 3.0 ± 1.1; n = 8); rostrum 8.2–35.9 µm long × 4.3–11.6 µm wide at the base, 2.0–5.2 µm wide at the apex. Pleurocystidia abundant, similar in shape but longer than the cheilocystidia, colorless, 26.5–88.8 × 12.5–25.2 µm (mean = 49.8 ± 19.1 × 18.5 ± 4.2 µm, E = 1.6–3.4, Q = 2.6 ± 0.6; n = 11). Lamellar trama hyphae long and tapered at both ends; cells 53.4–498.7 × 8.3–25.4 µm (n = 9). Pileipellis a cutis, 2–3 hyphal layers thick; hyphae 4.0–7.5 µm wide; terminal cells cylindric and at times somewhat swollen at the apex. Pileal trama hyphae slightly inflated beneath the pileipellis, 10.3–14.3 µm wide; cells overall 44.2–270.5 × 3.4–14.3 µm (n = 6). Stipitipellis a cutis; hymenial elements and distinct terminal cells absent. Stipe trama hyphae not studied. Refractive hyphae absent. Pigmentation minimal, cytoplasmic in the pileipellis and stipitipellis. Clamp connections absent.

Ecology, range, distribution — Solitary on litter of forest floor in *Dicymbe altsonii* forests on sandy soils; known only from the type locality at Mabura Ecological Reserve, Guyana.

Comments — *Nolanea rava* is distinguished by its conical, acutely umbonate, silky, hygrophanous, translucent-striate greyish yellow pileus and concolorous stipe, nearly obclavate to rostrate-ventricose cheilocystidia and pleurocystidia, nearly heterodiametric 5–6-angled basidiospores averaging 10.5 × 8.5 µm, and general lack of microscopic pigmentation. This combination of characters makes *N. rava* unique among previously described *Nolanea* species.

The overall basidioma aspect of *Nolanea acuta* resembles that of *Entoloma acutopallidum* E. Horak & Cheype from French Guiana (Horak & Cheype 2008). *Entoloma acutopallidum* differs from *N. rava* by its orangish clay-colored pileus, white stipe, cuboid basidiospores, clavate to vesiculose cheilocystidia, and lack of pleurocystidia.

Nolanea sinuolata Largent, Aime & T.W. Henkel, **sp. nov.** Plate 10

Mycobank MB 805597

Differs from all described species of *Nolanea* by its nearly concolorous dark brown pileus, lamellae, and stipe, cylindro-clavate cheilocystidia and caulocystidia that are slightly wavy to sinuous in outline, and externally encrusted pigment on the hyphal walls of the pileipellis and lamellar trama.

Type: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; 1 km NE of base camp, sandy zone E of Benny's Ridge, 29 August 2009, Henkel 8900 (BRG, **holotype**; HSU, **isotype**).

Etymology: *sinuolatus* (L. adj.) = faintly waved, referring to the cheilocystidia that are faintly wavy or sinuous in outline.

Pileus 11–24 mm broad, 5–12 mm tall, broadly conic with broadly rounded and flattened umbo, initially dark brown (6F4–6F5) throughout, then lighter concolorous (6E6 or 5E6) on the umbo and paling to light brown (5D6) toward the margin, glabrous macroscopically, under hand lens a contiguous mat with minute suberect elements over disc, moist, outer 1–2 mm of margin with faint translucent striations; marginal edge decurved, entire in areas, elsewhere very finely crenulate. Lamellae subthin, subcrowded, adnate, brown at first (concolorous with the pileus), then with pinkish overtones (5C4), finally dirty dull pink (6A2–6B2) with basidiospore maturation; margins whitish, densely cystidiate under hand lens; lamellulae 1–2 between lamellae, 0.5–3 mm long. Stipe 50–71 × 1.5–1.75 mm, equal, glabrous macroscopically, very finely twisting longitudinally striate under hand lens with a whitish basal bloom, otherwise dark yellowish brown (5F8) becoming dark brown (6F5–6F6) throughout, inserted, cartilaginous, hollow. Basal mycelium whitish and scant. Odor none or faintly spermatic; taste not obtained.

Basidiospores distinctly 5–6-angled in all views, in profile view isodiametric to heterodiametric, 6.7–9.5 × 5.3–7.9 µm (mean = 8.1 ± 0.6 × 6.8 ± 0.5 µm; E = 1.0–1.4, Q = 1.21 ± 0.1 subisodiametric; n = 47). Basidia cylindro-clavate and hardly tapered, rather narrow, 24.2–40.3 × 6.2–9.9 µm (mean = 34.0 ± 4.3 × 8.0 ± 1.12 µm; E = 3.2–5.8, Q = 4.33 ± 0.81; n = 17), 4–sterigmate. Cheilocystidia abundant, forming a sterile layer, colorless, narrowly cylindro-clavate and wavy to sinuous in outline, occasionally with a capitulate apex, 26.6–73.2 × 3.7–8.2 µm (mean = 49.7 ± 12.6 × 6.1 ± 1.18 µm; E = 3.9–12.8, Q = 7.23 ± 2.2; n = 22). Pleurocystidia absent. Lamellar trama subparallel to parallel, composed of broad hyphae, these 56–86 × 10–19 µm, along with narrow hyphae, these 83–85 × 7.2–7.4 µm (n = 9). Pileipellis a cutis but with a few loosely entangled clusters of cylindro-clavate terminal cells, semi–erect on the disc, repent elsewhere; terminal cells near disc 26.5–70.2 × 4.0–9.8 µm (mean = 43.8 ± 12.40 × 6.4 ± 2.22 µm; E = 4.61–14.32, Q = 7.41 ± 2.89; n = 12), near margin 51.2–88.2 × 4.0–7.0 µm (n/1 = 3). Pileal trama hyphae beneath the pileipellis rather short-celled and somewhat inflated; cells 38.9–138.8 × 7.0–17.9 µm (n = 9, not studied elsewhere). Stipitipellis with abundant clusters of caulocystidia, these similar in shape to the cheilocystidia; caulocystidia 28.8–77.9 × 3.4– 6.2 µm (mean = 45.5 ± 13.37 × 4.7 ± 0.99 µm; E = 5.0–13.5, Q = 9.9 ± 2.7; n = 12). Stipe trama hyphae broad in the center;

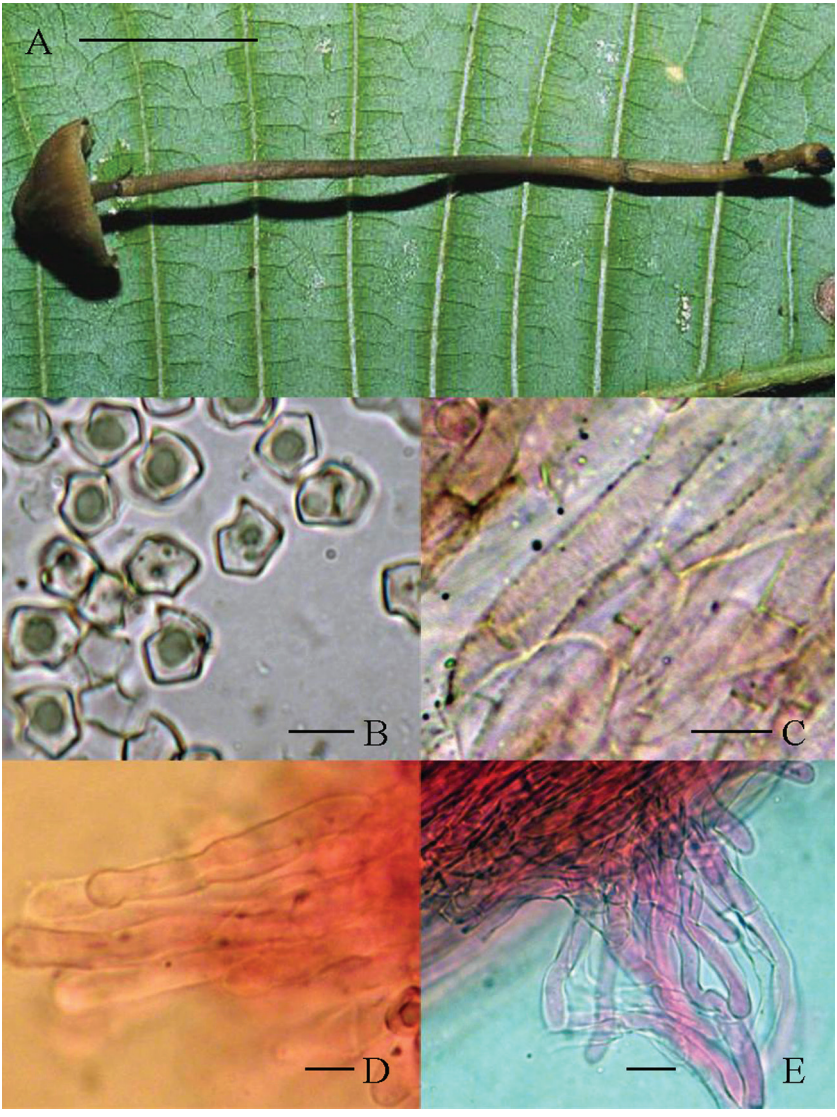

Plate 10. *Nolanea sinuolata* (holotype; Henkel 8900). A. Basidioma. B. Basidiospores. C. Pileus tramal hyphae with external encrustations. D. Cheilocystidia. E. Caulocystidia. Bars: A = 10 mm; B–E = 10 µm.

cells 81.0–228.0 × 13.5–20.3 µm (n = 5) and narrow near the stipitipellis; cells 168.3–223.2 × 3.0–3.5 µm (n = 5). Refractive hyphae absent. Pigmentation obvious and dark brown in 3% KOH in spot plates, dark brown in microscopic

sections, distinct and encrusting on the outer portions of the hyphae in the pileipellis, pileus trama, and lamellar trama. Clamp connections absent.

Ecology, range, distribution — Solitary on litter of forest floor in mixed *Dicymbe* spp. forest; known only from the Upper Potaro River Basin of Guyana.

Additional specimen examined. **GUYANA. Region 8: Potaro-Siparuni**. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; vicinity of base camp, 1 July 2003, Aime 2280 (BRG; PUL).

Comments — *Nolanea sinuolata* is diagnosed by its conic, broadly umbonate, dark brown pileus, brown, thin crowded lamellae, dark brown stipe, encrusted pigment on the pileus tramal hyphae, cylindro-clavate cheilocystidia with faintly wavy to sinuate sides, and 5–6-angled basidiospores averaging 8.1 × 6.8 µm. *Nolanea sinuolata*, *N. furcata*, *N. claviformis,* and *N. concentrica* (all described here as new) share the following features: a dark brown, conic or conic-campanulate, macroscopically glabrous but sericeous to faintly fibrillose pileus with a rounded, submammilate umbo; thin, close to crowded lamellae; a tough, cartilaginous stipe concolorous with the pileus; basidiospore shape; presence of cheilocystidia; an only slightly inflated subpellis; encrusted pigment on the outer hyphal walls of the pileipellis; and lack of clamp connections.

Among these species, *N. sinuolata* can be diagnosed by the brown lamellae when young, the encrusted pigment on lamellar tramal hyphae, cylindro-clavate cheilocystidia with slightly wavy walls and occasionally capitulate apex, the absence of cytoplasmic pigment in the pileipellis, and the lack of concentric ridges in the pileus. *Nolanea furcata* is distinguished by the white lamellae that fork toward the margin, the abundant tomentum covering the basal ¼ of the clavate stipe, the chlorine odor, and a cytoplasmic pileipellis pigment. *Nolanea claviformis* and *N. concentrica* have a concentrically ridged or beveled pileus, white lamellae, and also have a cytoplasmic pigment in the hyphae of the pileipellis. *Nolanea claviformis* is distinguished from *N. concentrica* by the clavate cheilocystidia, larger (~9.0 × 7.5 µm) basidiospores, and larger (28.3–42 5 × 9.5–12.0 µm) basidia. *Nolanea concentrica* has aciculate to rostrate-ventricose cheilocystidia, smaller (~7.7 × 6.0 µm) basidiospores, and smaller (24.2–30.6 × 6.7–9.5 µm) basidia.

Nolanea subsulcata Largent & T.W. Henkel, **sp. nov.** Plate 11

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Differs from *Entoloma guatopoanum* by its glabrous pileus and stipe.

Type: Guyana. Region 8: Potaro-Siparuni. Pakaraima Mountains. Upper Potaro River Basin, ~15 km east of Mt. Ayanganna, environs of base camp located on Potaro River one km upstream from confluence with Whitewater Creek at 5°18′04.8″N 59°54′40.4″W, elevation 710–750 m; vicinity of base camp in *Dicymbe* forest, 1 June 2005, Henkel 8825 (BRG, **holotype**; HSU, **isotype**).

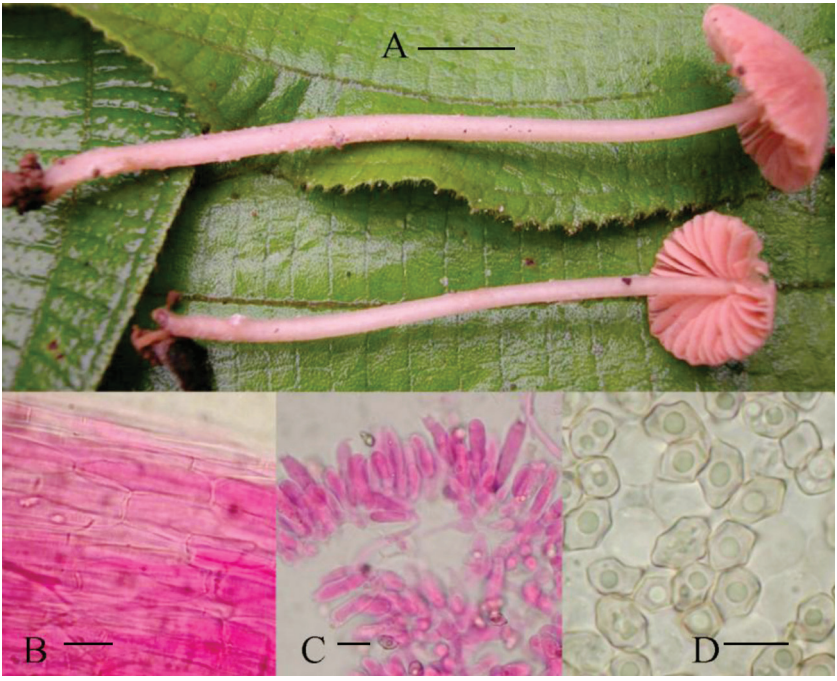

Plate 11. *Nolanea subsulcata* (holotype; Henkel 8825). A. Basidiomata. B. Pileipellis. C. Basidia. D. Basidiospores. Bars: A = 10 mm; B–D = 10 µm

Etymology: *sub–* and *sulcatus* (L. adj.) = somewhat grooved, referring to the pileus surface texture.

Pileus 16–22 mm broad, 5–10 mm tall, broadly conic with low, rounded umbo, brownish orange (6C4 "red-haired"–7C4) throughout, hygrophanous over disc with age, striate to subsulcate over outer 4/5, more smooth over immediate disc; surface glabrous and nearly translucent when fresh, under hand lens appearing finely longitudinally appressed-fibrillose, disc with no distinct vestiture, moist; margin finely and irregularly crenulate at sulcations; pileus trama extremely thin, less than 1 mm throughout. Lamellae subthin, subdistant, adnexed, brownish orange (7C4); margins concolorous, smooth; lamellulae 1 between lamellae, 1–2 mm long. Stipe 56–80 × 2–2.5 mm, equal, light greyish orange (6B3 "flesh"–6B4), appearing smooth but with fine appressed longitudinal fibrils under hand lens, cartilaginous. Basal mycelium absent. Odor and taste not noted.

Basidiospores distinctly 6–8-angled in profile, dorsal, and ventral views, sides slightly concave, heterodiametric, 8.2–12.3 × 5.1–7.2 µm, (mean = 9.7 ±

0.9 × 6.4 ± 0.51 µm; E = 1.3–1.8, Q = 1.5 ± 0.14; n = 31). Basidia subcylindric to subclavate, barely tapering toward base, 26.9–37.3 × 5.7–10.6 µm, (mean = 30.0 ± 3.0 × 8.3 ± 1.2 µm; E = 2.7–4.8, Q = 3.7 ± 0.63; n = 13), 2 or 4-sterigmate. Cheilocystidia and pleurocystidia absent. Lamellar trama subparallel, composed of broad, long-celled hyphae (not measured). Pileipellis a cutis of 1–3 uninflated hyphal layers; hyphae 3.2–10.0 µm wide; terminal cells cylindric to cylindro–clavate, 31.0–74.2 µm long. Pileus trama hyphae beneath the pileipellis moderately inflated, 5–18 µm wide, elsewhere 5-40 µm wide. Stipitipellis a cutis, lacking hymenial clusters or caulocystidia. Refractive hyphae abundant in the pileus trama, scattered in the lamellar trama. Pigmentation cytoplasmic, faintly evident in 3% KOH. Clamp connections absent.

Ecology, range, distribution — Solitary on humic litter layer of forest floor in *Dicymbe corymbosa* forest; known only from type locality in the Upper Potaro River Basin in Guyana.

Comments — *Nolanea subsulcata* is distinguished by its broadly conic, umbonate, subsulcate, translucent-striate, hygrophanous pileus with a paler crenulate margin; equal stipe; overall brownish orange to flesh colors throughout; lack of hymenial cystidia and clamp connections; and 6–8-angled, heterodiametric basidiospores averaging 9.7 × 6.4 µm. *Entoloma guatopoanum* (Dennis) E. Horak [≡ *Leptonia guatopoana* Dennis] from Venezuela, which also has a sulcate-striate similarly colored pileus and heterodiametric basidiospores measuring 9–11 × 6–8 µm and lacks hymenial cystidia and clamp connections, can be distinguished from *N. subsulcata* by its pruinose pileus and its white, minutely pruinose stipe with hyaline downy hairs (Horak 1977). *Rhodophyllus lutensis* Romagn. & Gilles from Gabon has similarly sized, shaped, and colored basidiomata but differs from *N. subsulcata* in its non-hygrophanous, non-striate pileus, and much smaller (7–8.2 × 5–6 µm) basidiospores (Romagnesi & Gilles 1979).

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